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Joon-seo Son

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06/14/2006

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EXAMINER

GEBREMARIAM, SAMUEL A

ART UNIT

PAPER NUMBER

2811

DATE MAILED: 06/14/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/762,075

Applicant(s)

SON ET AL.

Examiner

Samuel A. Gebremariam

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 30 May 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 10, 12-19, 21-33, 35 and 36 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 10, 12-19, 21-33, 35 and 36 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## **DETAILED ACTION**

### ***Request for Continued Examination***

1. A request for continued examination (RCE) under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 2/21/2006 has been entered. An action on the RCE follows.
2. The amendment filed on 2/21/2006 has been entered.

### ***Claim Rejections - 35 USC § 112***

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 10, 14, 19 and 33 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claims 10 and 14 recite the limitation of "at least partially discontinuous between at least two adjacent leads" is not clear as to what it means.

The limitation of "wherein the outside molded housing" as recited in claims 10, 14 and 19, is unclear whether it is the same element as the "molded housing" or it is separate element.

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Regarding claim 33, the limitation of "said partially covered lead", is unclear whether it is referring to the first, second and third leads or it is a separate element.

***Claim Rejections - 35 USC § 102***

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 10, 14-15, 19, 25 and 26 are rejected under 35 U.S.C. 102(b) as being anticipated by Furuse, US patent No., 6,043,111.

Regarding claim 10, as best the examiner is able to ascertain the claimed invention, Furuse teaches (fig. 4) a packaged semiconductor device comprising: a semiconductor die (14); a lead frame pad (11) for supporting the semiconductor die (14); a molded housing (17) encapsulating the lead frame pad (11) and the semiconductor die (14); a plurality of elongated leads (22,23) each having an inner portion extending from a first end inside of the molded housing (17), protruding through a side surface (fig. 4) of the molded housing (17) and terminating at a second end outside the housing to form an outer portion of each lead (22, 23), wherein a second lead is opposite to a third lead (leads 23/E on opposite ends of 22/B), wherein a first lead (22/B) is disposed between the opposing second and third leads (23/E on opposite ends), wherein the second (23 on the left) and third (23 on the right) leads each have a

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bent region along their respective lengths (refer to fig. 4), the bent regions being adjacent to the side surface (refer to fig. 4) of the molded housing (17), the bent portions formed to increase a space between the first outer lead (22) and the second (23 on the left) and third leads (23 on the right), wherein the molded housing (17) is formed on the bent portion of the second and third leads and is continuous between adjacent leads inside the side surface of the packaged semiconductor device (fig. 4) and is at least partially discontinuous (the molded package is partially discontinuous below the side surface region, where the leads protrude) between at least two adjacent leads (22,23) in a region of the leads outside the side surface of the packaged semiconductor device (refer to fig. 4).

Regarding claim 14, as best the examiner is able to ascertain the claimed invention, Furuse teaches (fig. 4) a semiconductor package in which a lead frame pad (11) to which a semiconductor die (14) is attached and inner leads (portions of 22,23 that are inside of 17) electrically connected to the lead frame pad (11) are covered by a molded housing (17), and outer leads (22,23) extended from the inner leads protrude from a side surface (refer to figure 4) of the molded housing (17) to the outside, wherein a second lead (23/E on the left) is opposite to a third lead (23/E on the right), wherein a first lead (22) is disposed between the opposing second and third leads (fig. 4), wherein the second (23/E on the left) and third (23 on the right) leads each have a bent region along their respective lengths (refer to fig 4), the bent regions being adjacent to the side surface of the molded housing (17), the bent portions formed to increase a space

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between the first (22) outer lead and the bent portions of the second (23/E on the left) and third (23 on the right) leads, wherein the molded housing (17) is formed on the bent portion of the second and third leads (fig. 4) and is continuous between adjacent leads (17 is continuous inside the side surface, fig. 4) inside the side surface of the packaged semiconductor device and is at least partially discontinuous between at least two adjacent leads in a region of the leads outside the side surface of the packaged semiconductor device (the molded package is partially discontinuous below the side surface region, where the leads protrude, refer to fig. 4).

Regarding claims 15, Furuse teaches the entire claimed structure of claim 14 above including a portion where the first (22) outer lead is adjacent to the side surface (refer to figure 4) of the molded housing (17) and is covered by the extended portion of the molded housing (refer to fig. 4, where 22 is covered by the extended portion of the molded housing).

Regarding claim 19, as best the examiner is able to ascertain the claimed invention, Furuse teaches (fig. 4) a semiconductor package in which a lead frame pad (11) to which a semiconductor die (14) is attached and inner leads (in portion of 22,23) electrically connected to the lead frame pad (fig. 4) are covered by a molded housing (17), and outer leads (outer portions of 22,23) extending from the inner leads protrude from a side surface (refer to figure 4) of the molded housing (17) to the outside, wherein the outer leads include a first (23 on the left) and second (23 on the right) lead, wherein at least one of the first (23 on the left) and second (23 on the right) outer leads is

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covered by an extended portion of the molded housing (17) where the extended portion is adjacent to the side surface of the molded housing (fig. 4); and wherein the second lead has a bent portion in a region adjacent to the side surface of the molded housing, the bent portion protruding to increase a space between the first outer lead and the bent portion in the molded housing; and wherein the outside housing is formed on the bent portion of the second lead (fig. 4).

Regarding claim 25, Furuse teaches (fig. 4) the entire claimed structure of claim 19 above including a third lead (22), wherein the third lead (22) is disposed in a central portion of the molded housing (17) and the first (23 on the right) and second (23 on the left) outer leads respectively are disposed to the right and left of the third lead (22).

Regarding claim 26, Furuse teaches (fig. 4) the entire claimed structure of claims 25 above including at least one of the first (23 on the right) and second (23 on the left) leads has a bent portion (refer to fig. 4) in a region where the leads are adjacent to the side surface of the molded housing, the bent portion protruding to increase a space between the first outer lead and the bent portion in the molded housing (refer to figure 4).

### ***Claim Rejections - 35 USC § 103***

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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8. Claims 12, 16, 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Furuse.

Regarding claims 12 and 16, Furuse teaches substantially the entire claimed structure of claims 10 and 14 above except explicitly stating that a distance between a surface of the molded housing covering the portion of the first outer lead and a surface of the molded housing covering at least one of the bent (inclination) portions of the second and third outer leads is 1 mm or more.

Parameters such as width and length in the art of semiconductor manufacturing process are subject to routine experimentation and optimization to achieve the desired device characteristics during fabrication.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to adjust the distance between a surface of the molded housing covering the portion of the first outer lead and a surface of the molded housing covering at least one of the bent portions of the second and third outer leads in the structure of Furuse as claimed in order to form a package with increased reliability.

Regarding claim 18, Furuse teaches substantially the entire claimed structure of claims 10 and 14 above including the second and third outer leads have an inclination portion (fig. 4), wherein at least one of the inclination portions of the second (23 on the left) and third (23 on the right) outer leads includes a portion which is perpendicular to a surface of the molded housing and a flat portion (refer to figs. 4 and 5, of APA and fig. 4 of Furuse).



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Furuse does explicitly teach the flat portion is larger than a thickness of the molded housing covering the inclination portions in a boundary between the inclination portions and the molded housing.

Parameters such as thickness and length in the art of semiconductor manufacturing process are subject to routine experimentation and optimization to achieve the desired device characteristics during fabrication.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to adjust the flat portion relative the thickness of the molded housing of Furuse structure as claimed in order to form a package with increased reliability.

9. Claims 13, 17, 22-23, 29-30, 33, 35 and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable in over Furuse in view of admitted prior art (APA).

Regarding claims 13, 17, 22 and 29, Furuse teaches substantially the entire claimed structure of claims 10 and 14 above except explicitly stating that a depression which is depressed toward a body of the molded housing is formed on at least one of a surface of the molded housing between the first outer lead and the second outer lead and a surface of the molded housing between the first outer lead and the third outer lead.

APA teaches (figs. 4 and 5) a depression which is depressed toward a body of the molded housing (41) is formed on at least one of a surface of the molded housing

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between the first outer lead (45) and the second outer lead (46) and a surface of the molded housing between the first outer lead (45) and the third outer lead (47) (APA, page 2, lines 19-26).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the depression that is depressed toward the body of the molded housing and formed on at least one of the surface of the molded housing between the first outer lead and the second outer lead and a surface of the molded housing between the first outer lead and the third outer lead as taught by APA in the structure of Furuse in order to increase the creepage distance between the leads (APA, page 2, last paragraph).

Regarding claim 23, Furuse teaches the entire claimed structure of claims 19 above including the second lead (23 on the left) has a bent portion in a portion where it is adjacent to the side surface of the molded housing (17), the bent portion protruding to increase a space between the first outer lead (22) and the bent portion in the molded housing (17, refer to figs. 4 and 5 of APA and fig. 4 of Furuse).

Regarding claim 30, Furuse teaches (fig. 4) substantially the entire claimed structure of claim 19 above including at least one of the first (23 on the left) and second (23 on the right) outer leads has a bent portion (refer to fig. 4) in a region where it is adjacent to the side surface of the molded housing, the bent portion protruding to increase a space between the third (22) outer lead and the bent portion in the molded housing (17).

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Regarding claims 33, Furuse teaches (fig. 4) a packaged semiconductor device comprising a semiconductor die (14); a lead frame pad (11) for supporting the semiconductor die (14); a molded housing (17) encapsulating the lead frame pad and semiconductor die (14, fig. 4); a plurality of elongated leads (22,23) each having an inner portion extending from a first end inside the molded housing (17), protruding through a side surface of the molded housing (fig. 4) and terminating at a second end outside the housing (17, fig. 4) to form an outer portion of each lead, wherein a second lead (23 on the right) is opposite to a third lead (23 on the left), wherein a first lead (22) is disposed between the opposing second and third leads wherein the second and third leads each have a bent region along their respective lengths (fig. 4), the bent regions being adjacent to the side surface of the molded housing (17, fig. 4), the bent portions formed to increase a space between the first outer lead and the second and third leads, wherein at a region outside the side surface a portion of the molding housing extends longitudinally from the side surface to cover a portion of the leads adjacent and outside the side surface and the molding housing extends partially laterally toward an adjacent lead.

Furuse does not explicitly teach a partial void of molding housing in a lateral direction between the partially covered lead and the adjacent lead.

APA teaches (figs. 4 and 5) a void (space between adjacent leads that is formed of the molding package 41) that is formed in a lateral direction between the partially covered lead and the adjacent lead (figs. 4 and 5).

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It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the partial void taught by APA in the structure of Furuse in order to increase the creepage distance between the leads (APA, page 2, last paragraph).

Regarding claims 35 and 36, Furuse teaches substantially the entire claimed structure of claims 29 and 33 above except explicitly stating that wherein a distance between a surface of the molded housing covering the portion of the first outer lead and a surface of the molded housing covering the bent portions of the second and third outer leads is 1 mm or more.

Parameters such as width and length in the art of semiconductor manufacturing process are subject to routine experimentation and optimization to achieve the desired device characteristics during fabrication.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to adjust the distance between a surface of the molded housing covering the portion of the first outer lead and a surface of the molded housing covering the bent portions of the second and third outer leads as claimed in the structure of Furuse in order to form a package with increased reliability.

10. Claims 21, 24 and 27-28, are rejected under 35 U.S.C. 103(a) as being unpatentable over Furuse, in view of Gagnon, US patent No. 5,859,387.

Regarding claims 21 and 24, Furuse teaches substantially the entire claimed structure of claims 19 and 22 above except explicitly stating that the second lead has an

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inclination portion in which a distance between the first outer lead and the inclination portion becomes larger as a distance between the inclination portion and the side surface of the molded housing becomes smaller, and wherein the inclination portion is covered by the extended portion of the molded housing.

Gagnon teaches (fig. 1) the second lead (16) having an inclination portion (fig. 1) portion in which a distance between the first outer lead (12) and the inclination portion becomes larger as a distance between the inclination portion and the side surface of the molded housing (plastic package) becomes smaller, and wherein the inclination portion is covered by the extended portion of the molded housing (refer to fig. 1).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the second lead having an inclination portion in which a distance between the first outer lead and the inclination portion becomes larger as a distance between the inclination portion and the side surface of the molded housing (plastic package) becomes smaller, and wherein the inclination portion is covered by the extended portion of the molded housing taught by Gagnon in the structure of Furuse in order to improve the reliability of the package.

Furthermore parameters such as width and length in the art of semiconductor manufacturing process are subject to routine experimentation and optimization to achieve the desired device characteristics during fabrication.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to adjust distance between the first outer lead and the inclination portion and the inclination portion and the side surface of the molded housing

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as claimed in the structure of Furuse in order to form a package with increased reliability.

Regarding claims 27-28, Furuse teaches substantially the entire claimed structure of claims 18-19, 21, 24-25, above including that at least one of first (23 on the left) and second (23 on the right) leads includes an inclination portion in which a distance between the third (22), central lead and the inclination portion becomes larger as a distance between the inclination portion and the side surface of the molded housing becomes smaller and wherein the inclination portion is covered by the extended portion of the molded housing (also refer to fig. 1 of Gagnon).

11. Claims 31-32, are rejected under 35 U.S.C. 103(a) as being unpatentable over Furuse, APA and in view of Gagnon.

Regarding claim 31, Furuse teaches substantially the entire claimed structure of claims 29, above including that at least one of the first and second leads includes an inclination portion (fig. 4).

Furuse does not explicitly teach that a distance between the third outer lead and the inclination portion becomes larger as a distance between the inclination portion and the side surface of the molded housing becomes smaller and wherein the inclination portion is covered by the extended portion of the molded housing.

Gagnon teaches (fig. 1) the second lead (16) having an inclination portion (fig. 1) portion in which a distance between the first outer lead (12) and the inclination portion becomes larger as a distance between the inclination portion and the side surface of the

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molded housing (plastic package) becomes smaller, and wherein the inclination portion is covered by the extended portion of the molded housing (refer to fig. 1).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the second lead having an inclination portion in which a distance between the first outer lead and the inclination portion becomes larger as a distance between the inclination portion and the side surface of the molded housing (plastic package) becomes smaller, and wherein the inclination portion is covered by the extended portion of the molded housing taught by Gagnon in the structure of Furuse in order to improve the reliability of the package.

Regarding claim 32, Furuse teaches substantially the entire claimed structure of claims 10, 19 and 31 above including the first and second outer leads includes a region which is perpendicular to a surface of the molded housing and a flat portion.

Furuse does explicitly teach the flat portion is larger than a thickness of the molded housing covering the inclination portions in a boundary between the inclination portions and the molded housing.

Parameters such as thickness and length in the art of semiconductor manufacturing process are subject to routine experimentation and optimization to achieve the desired device characteristics during fabrication.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to adjust the flat portion relative the thickness of the molded housing of Furuse structure as claimed in order to form a package with increased reliability.

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***Response to Arguments***

12. Applicant's arguments with respect to claims 10, 12-19, 21-33 and 35-36 have been considered but are moot in view of the new ground(s) of rejection.

***Conclusion***

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Samuel A. Gebremariam whose telephone number is (571)-272-1653. The examiner can normally be reached on 8:00am-4:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie Lee can be reached on (571) 272-1732. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

SAG  
June 11, 2006



**DOUGLAS W. OWENS  
PRIMARY EXAMINER**